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ABSTRACT

This study deals with word retrieval problems of aphasic patients. This word-finding difficulty is a common characteristic of aphasics and many methods have been used by aphasia clinicians to attempt to remediate word retrieval skills. Cueing, one of the methods used, presumably facilitates word-finding by supplying additional information to the aphasic patient about the target word he is attempting to produce. This research attempts to measure the three types of cues on naming behavior of aphasics. Semantic, phonemic, and neutral verbal cues are studied to determine their effects on both accuracy and latency of aphasic subjects' naming responses. The results demonstrated clear individual differences in the way that the aphasics responded to the various types of cues. In general, phonemic cues proved to be the most effective in increasing response accuracy and decreasing response latency for these patients. Semantic cues, on the other hand, appeared to hinder communicative effectiveness as they decreased response accuracy and increased response latency when compared to neutral or phonemic cues. A review of the literature discusses several factors that influence performance on a naming task. (NCR)

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THE EFFECTS OF THREE TYPES OF VERBAL CUES ON THE ACCURACY AND LATENCY OF APHASIC SUBJECTS' NAMING RESPONSES

by

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B.A., University of Maryland, 1975

Submitted to the Department of Speech and Drama and the Faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirements for the degree of Master of Arts.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

INTRODUCTION

One common characteristic of aphasic patients is word retrieval problems. In fact, Wepman found this word-finding difficulty so pervasive in the aphasic population that he said,

> Most consistent of all the language symptoms seen in aphasic patients is the difficulty in naming that appears in almost all patients. This inability to symbolize, to use common names for articles or objects or persons, is so widespread that many authors have classified patients showing it to a marked degree as a separate type of aphasia. (Wepman, 1951; p. 236)

Some other labels used for this phenomenon are anomia, naming deficiency, or nominal aphasia.

Aphasia clinicians spend much time and effort attempting to remediate word retrieval skills, not only because the word finding problem is a common one, but also because it frustrates and communicatively handicaps the patient. Yet, many of the methods clinicians use to facilitate improvement of these skills have not been studied experimentally. Aphasia clinicians must rely, therefore, on clinical hunches instead of hard data to back up their choice of therapeutic techniques.

Cueing is one of the methods often used clinically but on which little research has been conducted. Cueing presumably facilitates word finding by supplying additional information to the aphasic patient about the target word he is attempting to produce. The present study attempts to measure the effects of three types of cues on naming behavior

of aphasics. Semantic, phonemic and neutral verbal cues will be studied to determine their effects on both accuracy and latency of aphasic subjects' naming responses. Since cueing is a widely used therapy technique, it is considered desirable to study this procedure in a controlled manner.

In the review of the literature which follows, several factors which influence performance on a naming task will be discussed. Response latency as an index of word-finding difficulty will be reviewed in addition to word frequency and uncertainty, as these latter variables affect response latency. A description of the word frequency count from which stimuli were chosen will be included. Furthermore, the value of investigating commonly used therapy techniques will be illustrated. Finally, studies that have investigated cueing will be outlined, as well as a hypothesis that explains how successful results might be obtained from cueing.

REVIEW OF THE LITERATURE

Response Latency

Investigators interested in learning more about aphasics' word-finding difficulties have often used a naming-to-confrontation task together with a correct-incorrect scoring system. However, when correct-incorrect scoring alone is used, another important variable in a naming task, response latency, is not measured. As latency of response decreases on a naming task, the word retrieval process is presumably becoming more efficient. As Wiig and Globus (1971, p. 203) stated,

> Further research should attempt to isolate the effects of differences in information processing ability between aphasic and non-aphasic subjects. Response time should be a measure reflecting aspects of information processing. Thus, longer latencies from aphasic subjects on a word identification task would indicate reduced information processing efficiency.

Thus reduction of response time is important clinically even if response accuracy is already present, as it implies that a patient's word retrieval processes are becoming more efficient.

Quinting (1971) demonstrated the presence of word-finding difficulties in aphasics by measuring the length of pauses in the speech of normals and aphasics. He found much longer pauses in the speech of aphasic subjects than in normal subjects, especially before nouns and noun phrases. If Quinting's findings are replicable, it follows that when confronted by a naming task, pause time or response latency will be greater in aphasics than in normals.

Several investigators who have compared responses of aphasics with those of normal subjects on various tasks have indeed found longer reaction times (RT) or increased response latency demonstrated by their aphasic subjects (Arrigoni and De Renzi, 1964; Benson and Barton, 1970; and Mills, 1975). Mills' study is particularly germane to the present study as he used a picture naming task among others. The aphasics produced a significantly greater mean reaction time to the picture naming task than the normal group.

Various characteristics of the words used in a naming task seem to affect reaction time in both aphasic and normal subjects. One of these characteristics is codability. This term refers to the number of words that may be used to label a single concept or object; the codability of

an item becomes lower as more words can be used in its place, and its uncertainty becomes higher. Lachman (1973) found that as items increased in uncertainty and decreased in codability, a significant increase in naming reaction time took place in 29 normal subjects. Mills (1975) used 20 aphasic subjects as well as 40 normal subjects and achieved the same results with both groups: high uncertainty stimulus items caused longer reaction times than low uncertainty items.

Yet another characteristic of the words in a naming task that may affect naming response time is their frequency of occurrence in the language. Oldfield and Wingfield (1965) found that naming RT was linearly related to the log of word frequency in normal subjects. Newcombe, Oldfield and Wingfield (1965) performed a followup study using brain damaged subjects and reported the same results. Long (1976), however, found no difference in the amount of time for a subject to accurately label items with high and low frequency of occurrence. She stated that this seemingly discrepant finding might have been due to the fact that she included naming response time on correct responses only in her analysis while the other studies included both correct and incorrect responses.

That the grammatical class of the word may also affect naming response time was reported by Long (1976). Long found that a significantly greater time was required by aphasics to name verbs than to name nouns.

Response Accuracy

The frequency of occurrence of a word appears to affect accuracy of response as well as reaction time. Rochford and Williams (1963) found an increase in proportion of correct responses in adult aphasics to be positively correlated with greater frequency of occurrence of the stimulus noun. Long (1976) cited this result as well. In the same study, she also found grammatical class to affect response accuracy, as a higher degree of accuracy was obtained for nouns than verbs. Mills (1975) found an additional factor affecting accuracy of response to be the uncertainty of the stimulus item. As uncertainty decreased, response accuracy increased.

Word Frequency Counts

The above mentioned studies that looked at word frequency as a variable used word frequency counts derived from written samples, although their subjects were performing spoken tasks. Howes (1966), the compiler of a spoken word count, cites these problems with the commonly used Thorndike-Lorge (1944) tables based on printed material:

> For most experimental applications, however, the frequency of occurrence of a word in the spoken discourse of the Ss is the quantity one wants to estimate. For these purposes the Thorndike-Lorge tables are open to two important sources of error, each of unknown magnitude: the difference between spoken and printed language, and the changes of English usage that have taken place since the time of the writings on which the tables are based. (p. 572)

For these reasons, Howes compiled a table of word frequencies based on spoken language to replace an outdated one performed by French, Carter and Koenig in 1930. The corpus on which Howes' count is based is

250,000 words obtained through interviewing 40 subjects. The word count derived from the corpus consists of 9,699 words.

To obtain the corpus, subjects were interviewed and asked to talk on any subject they wished. If the subjects' monologues faltered, an interviewer asked a general question such as, "Tell me about your family." One hundred thousand words of the corpus were elicited from 20 university students, and 100,000 words were provided by 20 Veterans Administration Hospital patients free of known cerebral defects and of acute or debilitating disease. The additional 50,000 words were taken from a single subject, in order to study the stability of the word frequency data across repeated measures for an individual subject. For the purposes of the present investigation, the corpus provided by the hospital patients was used to determine word frequency, since the aphasic subjects in this study were also patients at a Veterans Hospital and might be expected to have similar backgrounds in terms of both education and experiences.

Practice Effect

In their 1963 study, Rochford and Williams studied the effect of phonological and semantic cues on naming accuracy across repeated trials with the same stimuli. They found improvement in naming ability as measured by response accuracy. However, this improvement could have been due to a possible practice effect. The literature is divided on whether such an effect exists with aphasic subjects; Rochford and Williams were struck more by the similarity of errors that the aphasics made on trials as much as three months apart than the improvement across

trials that they noted. Oldfield and Wingfield (1965) observed improvement across two trials but not a third using the same stimuli. However, Schuell et al. (1964) felt that consistency of errors occurred across trials. The latter authors stated, "Practice effects from test to retest must certainly be negligible for aphasic subjects, who require intensive reinforcement to hold language acquisition from one day to another." (p. 179) While inconclusive, these contradictory viewpoints suggest that an investigator should control for the possibility of a practice effect.

Investigation of Routinely Used Therapy Methods

The need to investigate routinely used therapeutic procedures becomes evident when a study such as Helmick and Wipplinger's (1975) is reviewed. This study involved using a common therapy technique, repetition of stimulus, claimed by Schuell (1967) to enhance naming skills in aphasic subjects. The authors used three different conditions to determine if repetition of a stimulus in various contexts increased the number of vocabulary words correctly identified from a picture stimulus by a single subject.

Forty-five incorrectly named pictures were used as stimuli, and the authors used Schuell's (1967) comments as guidelines in selecting the number of stimulus repetitions used in treatment. In the first condition, each of 15 pictures was presented in six different contexts once every other day for four weeks. In the second condition, administered on a different day from condition one, each picture from a different group of 15 pictures was presented in the six contexts four times each. Thus

in the first condition, each stimulus was repeated six times while in the second condition it was repeated 24 times. In the third condition, the last 15 pictures were presented to the patient for naming with no repetitions.

Results of these procedures showed that in all three conditions the number of pictures correctly named increased. The increases in conditions one and two were greater than that in the no treatment condition, however. In addition, there was no difference in the gains made between condition one and condition two. That is, there was no difference in number of vocabulary words learned, whether six or 24 repetitions were used to teach them. Thus, increasing the number of repetitions was found to be not significant in improving the naming skills of this patient, yet large numbers of stimulus repetitions are routinely used by aphasia clinicians. As Helmick and Wipplinger stated,

> The results also indicate that as clinicians we need to scrutinize closely even those techniques that we routinely apply in our management programs. Such objective analysis of treatment programs can reveal the most effective use of therapeutic techniques for the individual aphasic patient, can define the appropriate terminal language behaviors to be used and allow the patient to encounter success by meeting those goals, and can provide a basis upon which to build a comprehensive rehabilitation program. Furthermore, the isolation, control and evaluation of other routinely employed therapeutic variables could provide the kind of information needed for the development of improved treatment techniques for the aphasic patient. (p. 29)

Because this study employed only one subject and used a small number of stimulus items, the authors could not generalize their results to the aphasic population as a whole. However, it is evident that for this one patient at least, increasing the number of stimulus repetitions was not an appropriate choice of therapy technique.

Results of another investigation indicate that while a commonly used therapy technique may be useful to enhance naming of items on a specific therapy task, the advantage may not generalize to spontaneous naming ability. Brookshire (1975) presented a set of training pictures and a set of probe pictures to aphasics and asked them to name the pictures. On the set of training pictures, if the subject failed to name the picture, the experimenter prompted the subject by saying the word and having him repeat it. On the set of probe pictures, no prompt was used. Prompting improved performance only slightly on training pictures and this effect did not generalize to those pictures on which no prompt was used. Again, although prompting, by having the patient repeat the word after the clinician, is commonly used in therapy, it seems to facilitate naming only slightly on those items with which it is used and does not generalize to a spontaneous naming task.

Picturability

Many of the previously discussed studies have used pictures as stimuli. However, a little-mentioned factor in these studies is that of picturability. Picturability of stimulus items is defined by Goodglass et al. (1969) as "...referring to objects which have 1) definite visual configuration, and 2) presumably elicit a very similar visual image in any English speaker who hears the name."

It is important that pictures of items evoke the same response from normal subjects when accuracy of response will be judged in a naming study. If a consensus for the name of the picture is not obtained before presentation of the stimulus, the uncertainty value of the item is

in question. Since the variable of uncertainty was not being studied in the present investigation, picturability of stimuli was determined prior to administration of the items.

Cueing

Little attention has been given in the experimental literature to the effects of cueing procedures on the naming abilities of aphasics, despite their common use in aphasia therapy. Cueing, alternatively labeled clueing, involves presenting extra information to the patient along with the item to be named. This extra information may be a semantic cue, linked to the target by a common meaning, or a phonemic cue, sharing a common sound with the target. The cue might also be a different form of the same target word presented in another modality. For example, a written cue might be presented if the target were to be spoken, or the cue might be the spelling of the target word for the patient if a written word were the desired response.

Many references to cueing assume that such procedures are beneficial and then elaborate on methods for employing cueing, or describe various types of cues to be used in therapy. For instance, McDearmon and Potter (1975) described symbolic cues and realistic cues and discussed pairing of these cues in aphasia therapy. Symbolic cues referred to a written or spoken cue, and realistic cues referred to an actual object. By pairing these cues, the authors were intending to contrast representational and associative prompts for the patient, and thus produce informational redundancy. For instance, they recommended pairing objects with pictures or objects with actions to evoke appropriate labeling from the patient.

Berman and Peelle (1967) described five case histories of aphasic patients who were taught to generate their own cues. The type of cue used varied with the individual patient. Although no data was cited, the authors felt that the self-generated cues facilitated word-finding. However, one criterion for inclusion in the project was correct responses to the clinicians' cues. It seems unlikely that patients who were unable to respond to externally generated cues would be able to formulate or respond accurately to internally generated cues. Therefore, it is possible that self-generated cues are useful for only a limited portion of the aphasic population. Data is needed in this area before conclusions can be drawn.

Some experimental evidence does indicate that cueing facilitates some aspects of naming ability. Wiig and Globus (1971) found that logical, high association clue words and infralogical, high association clue words presented simultaneously with a picture stimulus increased accuracy of response in normals and aphasics as opposed to use of logical, low association and infralogical, low association clue words presented in the same manner. Logical clues were those related to target words by class membership and class relationship, while infralogical clues were related to the target by a temporal or spatial relationship. For instance, a logical clue for the target word "car" might be "auto," while an infralogical clue might be "garage." As their source for target and clue words, the authors cited The Michigan Restricted Association Norms (Riegel, 1965), which also provided a measure of association strength.

Another finding of interest was that logical, high association clue words produced more correct responses than did infralogical, high association clue words in both normal and aphasic subjects. The logical cues used in this study were of three types: similar, that is, synonymous; superordinate; or subordinate. An example given of a similar clue for the word "car" was "auto." A superordinate clue for "fork" was "silverware," while a subordinate clue for the word "silverware" was "fork."

Rochford and Williams (1962) found an increase in response accuracy when semantic and phonological cues were administered. These authors used four types of cues, administered by the examiner after a subject signalled he was unable to recall a noun. The first type of cue was a description of the object's use. The second type provided a verbal context for the target word, such as an open-ended sentence, and the third type tried to evoke the target noun by using a rhyme or a different verbal context. Finally, the fourth cue was spelling the target word aloud. Rochford and Williams found the second, third, and fourth cueing conditions to be equal in usefulness, and all to be more useful than the first condition, judged by proportion of correct responses.

However, although response accuracy to the last three conditions was equal, it will be noticed that contextual cues were used in both conditions two and three. Contextual cues, when looked at independently from the condition in which they were used, were found to evoke the greatest number of correct responses.

Response latency was not studied in Rochford and Williams' 1962 work. Therefore, it is possible that one of the cueing conditions may

have increased the efficiency of the aphasics' responses by decreasing response latency. This information is not reflected by the number of answers correct that each condition produced.

Another study (Barton, Maruszewski, and Urrea, 1969) used semantic cues or pictures to discover the effect that various stimulus contexts had on word finding ability. Of three conditions, description of the target word, open-ended sentences, and picture confrontation, picture confrontation was never the easiest task for any subject. However, the order of difficulty of the tasks, as measured by the percentage of correct responses, varied for different subjects.

For the majority of the 36 subjects, completing open-ended sentences such as "In order to tell time, we usually wear a _____" was the easiest task. This finding agrees with that of Rochford and Williams (1962) that contextual cues were most useful in evoking correct responses. It might be hypothesized that this was because the subjects were receiving additional information in the form of associational semantic cues from the open-ended sentences, while the visual cue provided by the picture task was of little help in retrieving the lexical item. It seems logical to project from this study that presenting a picture combined with a semantic cue will facilitate word retrieval more than confronting a patient with the picture alone or with a nonmeaningful verbal cue.

Aphasics themselves seem to use cueing procedures when attempting to retrieve a word. Barton (1971) found that aphasics unable to recall a whole word could state the initial letter of a target word or the

number of syllables it contained above chance level. Thus, information is available to the aphasic about the nature of the word he is trying to retrieve.

Marshall (1976) in a descriptive study of the conversational speech of 18 aphasics mentions five different types of word retrieval behaviors, or self cues, that the aphasics used to facilitate retrieval of a word, with varying degrees of success. The five types were delay; semantic association; phonetic association, or production of words with phonemes in common with the target word; description; and generalization, i.e., production of words unrelated to the target. While semantic association and generalization were the tactics most often employed by the aphasics in their conversational speech, delay was the behavior most frequently followed by the intended word, with a 90.6% success rate. Semantic association and phonetic association followed with success rates of 56.7% and 56.6% respectively. Description prompted the target word only 34.9% of the time, while generalization was least successful, being followed by the target on 17% of the attempts.

Word Finding Difficulties as Retrieval Problems

If cues, either self or clinician generated, are successful in helping a patient recall a word, this implies something about the nature of his problem. It implies that aphasia does not cause a reduction in lexicon but rather causes a problem with retrieval of the lexical item. If the word were not still present in the lexicon, no cue would enable the patient to retrieve it. Several studies (Barton, 1971; Wiegel-Crump

and Koenigsknecht, 1973) support this notion that word-finding difficulties in aphasia are retrieval problems rather than loss of vocabulary.

The recall of attributes and parts of a word is called generic recall by Brown and McNeill (1966). They found that when normal subjects were in a "tip of the tongue" state right before word recall, generic recall was possible. Barton (1971), mentioned earlier, studied this phenomenon and found it to exist in aphasic subjects. The aphasics evidenced generic recall by stating the initial phoneme or the number of syllables of a target word above chance level. This finding indicates that some target words may be contained in the aphasic's lexical store, but while he can recall attributes of the words, he is unable to retrieve whole words.

The findings of Wiegel-Crump and Koenigsknecht (1973) also support this theory. Items within various superordinate lexical categories were drilled. Then reaction time before accurate responses were measured on both drilled and nondrilled items. RT decreased on both drilled and nondrilled items within categories. Since reduced RT was noticed on nondrilled items within a category, this indicates that retrieval skills had been improved for that group of lexical items. If the items had been lost from the lexical store, generalization could not have occurred to nondrilled items.

Summary

Two variables are of prime importance when studying word finding difficulties. These are response accuracy and response latency. As

response latency is reduced, communication becomes more efficient, so inclusion of this variable in a naming study yields valuable information.

The frequency of occurrence of a word affects both response accuracy and response latency. Low frequency words produce both greater inaccuracy and greater latency of response. If low frequency words are used in a naming task, one would expect delays and inaccuracies in subjects' responses, given no intervening variables. Low frequency target words used in this study were chosen from a spoken word count as opposed to a written one, as the present naming task was a spoken one.

The value of evaluating commonly used therapy techniques experimentally has been discussed. In previous studies, some of these techniques such as prompting or stimulus repetition have not been shown to be useful or have not facilitated carryover of skills into spontaneous naming. Other techniques have been successful, such as use of logical high association strength cues to increase accuracy.

Cueing is a therapeutic procedure often used in aphasia therapy. Use of it is based on the hypothesis that aphasics retain their premorbid lexical store, but have difficulty retrieving the word from the lexicon. If cueing does not enhance naming ability, as measured by increased response accuracy or decreased response latency, then this hypothesis may be called into question as well as the efficacy of cueing as a therapeutic technique.

Statement of the Problem

An attempt was made in the present study to answer the following questions:

1. What effect do semantic, phonemic, and neutral verbal cues have on the accuracy of aphasic subjects' naming responses?
2. What effect do semantic, phonemic, and neutral verbal cues have on the latency of aphasic subjects' naming responses?

CHAPTER II

METHODOLOGY

Stimuli: Pictorial and Verbal

The pictorial stimuli represented low frequency nouns chosen from Howes' (1966) word count of spoken English (Appendix A). It might be recalled that this count consisted of three corpora, one from hospital patients, one from university students, and one from a single subject; the hospital patients' corpus was selected for use in this study. The words in the hospital patients' corpus ranged in frequency from zero to 3,665 occurrences per 100,000 words. The frequency of 3,665 represents the word "and." A common noun, "boy," occurred 43 times, while another common noun, "car," occurred 17 times per 100,000. Thus, low frequency was arbitrarily defined for the purposes of this study as those nouns that occurred three or fewer times per 100,000 words in the corpus obtained from the hospital patients in Howes' study. To help insure that stimuli were uniform with regard to word frequency, as many nouns as possible were chosen from among those nouns that occurred two times per 100,000 words in the corpus. Because of the difficulty of finding low frequency picturable stimuli in the hospital patients' corpus alone, nine words were obtained from the corpus as a whole, which included both hospital patients and university students. Thus, nine of the target words in Appendix A with a stated frequency of zero did not appear in the hospital patients' corpus but occurred with varying frequencies in the university students' corpus. This frequency number occurs in parentheses after the zero.

The investigator chose 100 low frequency nouns from the word count that seemed to fit the definition of picturable that Goodglass et al. (1969) provided: "...those referring to objects which have 1) definite visual configuration, and 2) presumably elicit a very similar visual image in any English speaker who hears the name." Pictures were then found which seemed to represent the nouns. Pictures were 5 x 7 colored drawings obtained principally from the Peabody Language Kits.

To insure that the definition of picturability was met by the chosen stimuli, the 100 pictures of low frequency nouns were presented three times to a group of ten normal adults. The normal group was matched to an aphasic group of subjects for mean age and mean number of years of education (Appendices B and C). The normal subjects were read the following directions:

1. Please look at each picture, and write down the best name for it. For this sample picture the best name would be "hammer." (A picture of a hammer was shown.)

2. Now go through the pictures again. In the column marked "next best," write down the next best name for the picture. The next best name does not have to mean exactly the same thing. For instance, for this picture you might write "tool." (The picture of the hammer was again shown.)

3. The third column is marked "password." Have you ever seen the game Password on T.V.? I want you to think of a word that would make a person think of the name of the picture. For instance, for "hammer" the password might be "nails" or "pound."

For a stimulus to be included in the study, agreement among eight of ten subjects was required as to the best word for the picture. The picture of "bathroom" was an exception, receiving the consensus of only seven of the ten normal subjects.

Seventy stimulus pictures were selected. Sixty of these pictures constituted the test items and the ten remaining stimuli were used as practice items (Appendix A). Consensus on picturability was not required for the practice items, but ranged from six to seven agreements by the ten normal subjects. Each stimulus word was assigned both a phonemic cue and a semantic cue word.

To select a semantic cue for the stimulus words, the word most often given by the normals in response to the stimulus item as a "next best" word or "password" was chosen (Appendix A). Consensus on the semantic cues ranged from two of the subjects listing it to eight of the subjects listing it (Appendix A). The majority of semantic cues received the consensus of four or six of ten of the normal subjects (Table I).

Phonemic cues were chosen as follows: for those stimulus items containing four or more phonemes, the first three phonemes were used as a phonemic cue. For three phoneme words, the first two phonemes were used, and for two phoneme words, the first phoneme was used. In this selection process, diphthongs were counted as one phoneme, and plural morphemes were not counted as a phoneme (Appendix A).

To assign the cues, the 60 stimuli were arranged alphabetically in order of decreasing frequency of occurrence. The first stimulus was assigned a semantic cue for subjects one and four, a phonemic cue for subjects two and five, and a neutral cue, the word "ready," for subjects three and six (Table II). The order of cues was then alternated down the list for each subject group. The word list was randomized before presenting it to each subject.

Table I. Consensus on Semantic Cues

Number of Subjects	Number of Stimulus Items
2 of 10 subjects listed the identical cue word for	3 stimulus items
3 of 10 subjects listed the identical cue word for	13 stimulus items
4 of 10 subjects listed the identical cue word for	14 stimulus items
5 of 10 subjects listed the identical cue word for	13 stimulus items
6 of 10 subjects listed the identical cue word for	14 stimulus items
7 of 10 subjects listed the identical cue word for	2 stimulus items
8 of 10 subjects listed the identical cue word for	1 stimulus item

Table II. Sample Stimuli, with Different Cues for Different Subjects

Stimulus	Cues		
	Subjects 1 & 4	Subjects 2 & 5	Subjects 3 & 6
1. Ambulance	"emergency" semantic	/æmb/ phonemic	"ready" neutral
2. Stool	/stu/ phonemic	"ready" neutral	"sit" semantic
3. Tennis	"ready" neutral	"court" semantic	/tɛn/ phonemic

Word list randomized before presentation

Subjects

Six adult males diagnosed as aphasic were selected to be included in the formal study. The Porch Index of Communicative Ability (PICA) (Porch, 1967) was used to ascertain that these subjects suffered from generalized impairment of language functioning. All subjects met the following criteria (Appendix C):

1. A history of CVA or trauma involving the left hemisphere.
2. At least three months post-trauma or CVA, indicating some degree of neurological stability.
3. At least an eighth grade education to insure that lack of recall of stimuli indicated word finding difficulties and not premorbid vocabulary deficits.
4. An overall mean score on the last administered PICA that represents the 45th percentile or higher.
5. Mean scores of 6.00 or higher on subtest IV (object naming) of the PICA.
6. Passed a Veteran's Administration Hospital dyspraxia/dysarthria screening test (Appendix D) with a median score of two or less.
7. Mean scores of 10.00 or higher on subtest XI (object matching) to control for visual difficulty.
8. Mean scores of 10.00 or higher on subtest X (object pointing) to control for hearing difficulty.

Race was not considered in subject selection, nor was length of time post onset, nor previous therapy received. Prior to participation in the study, a consent form was signed by each aphasic and normal subject,

after an explanation of the study was provided by the examiner (Appendix E).

Procedures

Before the test stimuli were presented the following directions were read to each subject by the examiner:

> Pictures of objects will be shown to you. I will say a word or a syllable when I show you the picture. When you see the picture, tell me the name of the picture. The name of this picture would be "hammer." If there is an arrow on the picture, name what the arrow is pointing to.

Ten practice pictures, accompanied by cues, were presented to each subject to make sure he understood the task (Appendix A). The test stimuli were presented one at a time, accompanied by a spoken semantic or phonemic cue, or the neutral cue "ready." The subject's response was then scored as correct or incorrect, based on the target word chosen from Howe's word list. However, if a subject added or deleted a plural morpheme from the target, it was scored as correct. As soon as the subject responded to a stimulus, the next picture was presented. If the subject made no response to a stimulus within 30 seconds, the examiner proceeded to the next test item and the response was scored as inaccurate. The testing for each subject required one session lasting no more than an hour.

Each session was videotaped, and response latency measurements were taken from the tape. The examiner used a tenth of a second stopwatch to measure the time from the presentation of a test stimulus to the initiation of subject's response. If the subject made more than one response to a stimulus, his final response was scored. If the subject

made two correct responses such as "car...uh...car," the length of time to the first response was arbitrarily chosen as the unit measured. Incorrect responses were not measured.

Each of the six subjects was presented with three conditions. In the first condition the spoken word "ready" accompanied randomized presentation of all 60 stimulus pictures (Table III). The purpose of the word "ready" was to attempt to control for the effects that any accompanying neutral verbal stimulus might have had on the aphasics' naming behavior, for instance a delay as the aphasic auditorily processed the stimulus.

In the second condition, 20 of the total of 60 stimulus words were presented with semantic cues, 20 of the words were administered with phonemic cues, and 20 words were accompanied by the spoken word "ready" (Table II). The order of the words and cues was randomized. Two subjects received a given stimulus item with a phonemic cue, two received the same item with a semantic cue and two received it with the "ready" cue in this condition as shown in Table II. This was to further help control for possible ease or difficulty of individual stimulus items. Condition three consisted of the same random presentation of the 60 stimuli, again accompanied by the "ready" cue (Table III).

Reliability

To check for reliability, all sessions were recorded on video tape. Two experienced speech pathologists, in addition to the investigator, independently measured response latency and judged response accuracy from the tapes. Ten percent of each subject's responses (18 responses)

Table III. Presentation of Stimuli

	Condition		
	I	II	III
20 words	neutral	semantic	neutral
20 words	neutral	phonemic	neutral
20 words	neutral	neutral	neutral
60 words total	60 words total	60 words total	60 words total

Words in Conditions I, II, and III presented in random order

were selected to check for reliability. Although the 18 selected responses were consecutive, the response used as a starting point was chosen randomly for each subject.

The two judges were each given a list of the target stimuli. They scored accuracy from the videotape first, indicating whether they thought the subject's final verbal response agreed with the target word. When a subject made no response within 15 seconds, the judges were told to score this as an inaccurate response. For a response to be scored as reliably accurate, one or both of the judges had to agree with the investigator's scoring of the response.

Each judge then viewed the videotape again. Each used a tenth of a second stopwatch and measured to the nearest tenth of a second the time from the investigator's verbal cue to the time of the subject's final response. Incorrect responses were not measured. If the subject gave two correct responses, the time to the first response was measured. For the response latency measurement to be judged reliable, one or both of the judges had to agree within four tenths of a second with the investigator's measurement.

Reliability was determined for both response accuracy and response latency by using the following formula:

$$R = \frac{\text{number of agreements}}{\text{number of responses}}$$

The number of agreements was reached by calculating the number of times one or both judges agreed with the investigator's scoring of the response. For response accuracy 100% agreement was obtained.

For response latency, two percentage agreement figures were calculated. For the first figure, a .2 second error margin was allowed between times considered to agree, and for the second figure, a .4 second error margin was allowed. With the .2 second error margin, the percentage agreement was 70% and for the .4 second error margin, the percentage agreement was 89%.

Because the agreement obtained with the .2 second error margin was considered to be unacceptably low, the .4 second error margin was used in interpreting the graphs of the time latency data from each subject.

CHAPTER III

RESULTS AND DISCUSSION

At the outset of this investigation, the investigator posed two questions:

1. What effect do semantic, phonemic, and neutral verbal cues have on the accuracy of aphasic subjects' naming responses?
2. What effect do semantic, phonemic, and neutral verbal cues have on the latency of aphasic subjects' naming responses?

In the following sections, data will be reported and interpreted in an attempt to answer these questions. A discussion of the length of the waiting period allowed the aphasics to respond will be given, and a description of the display of each subject's data will follow. The data on both response accuracy and response latency will be reported and discussed for each subject. Data will then be compared for pairs of subjects who received identical treatment conditions. Group trends will be reviewed along with possible explanations for these trends. Finally, implications for treatment and future research will be elaborated upon.

Choice of Waiting Period

When the present study was designed, there was a question about whether to wait 15 seconds or 30 seconds for each aphasic subject to respond to a stimulus item. During the testing, the investigator waited 30 seconds for each response and if no response was forthcoming, proceeded to the next item. However, the resultant data was computed

on the basis of a 15 second waiting period, with those correct responses taking a longer period counted as incorrect. The rationale for this was that because there were very few correct responses by any subject that took longer than 15 seconds (Table IV), those that occurred caused a positive skew in the mean response time data. Figure 1 demonstrates a comparison between two subjects' 15 and 30 second response time data. Subject 1 had identical curves for response time regardless of which waiting period was used to compute the data, as he had no correct responses that took longer than 15 seconds to occur. The majority of the other subjects also had similar graphs when the data using the 15 second and the 30 second waiting period were compared. Subject 3, however, due to a few lengthy correct responses, showed marked differences between the two graphs. It was felt that this subject's performance was more accurately reflected by the graph using the 15 second waiting period for the reasons outlined above.

Because so few of this group of aphasics' responses occurred after 15 seconds, it might be that a 15 second wait could be used as a cut-off point in other naming studies involving aphasics. When such a cut-off point is being determined, however, it should be kept in mind that the aphasics involved in the present study were relatively high level.

Timing Device

A hand stopwatch was used to measure response times, as Tait (1976) found no significant difference between mean phonation times determined with a stopwatch and the same times determined with a ruler, measuring length of phonation from a tape recording. However, because the stopwatch

Table IV. Distribution of Accurate Response Times from 1-30 Seconds for Each Aphasic Subject.

	Seconds								
	0-.9	1-1.9	2-2.9	3-3.9	4-4.9	5-5.9	6-9.9	10-15	15-30
S_1	8	79	28	21	2	7	5	2	0
S_2	41	76	12	6	2	2	1	1	1
S_3	5	61	30	10	4	6	10	2	6
S_4	11	54	25	10	8	4	4	7	3
S_5	1	45	17	10	8	13	15	10	7
S_6	3	46	35	28	9	9	13	5	6

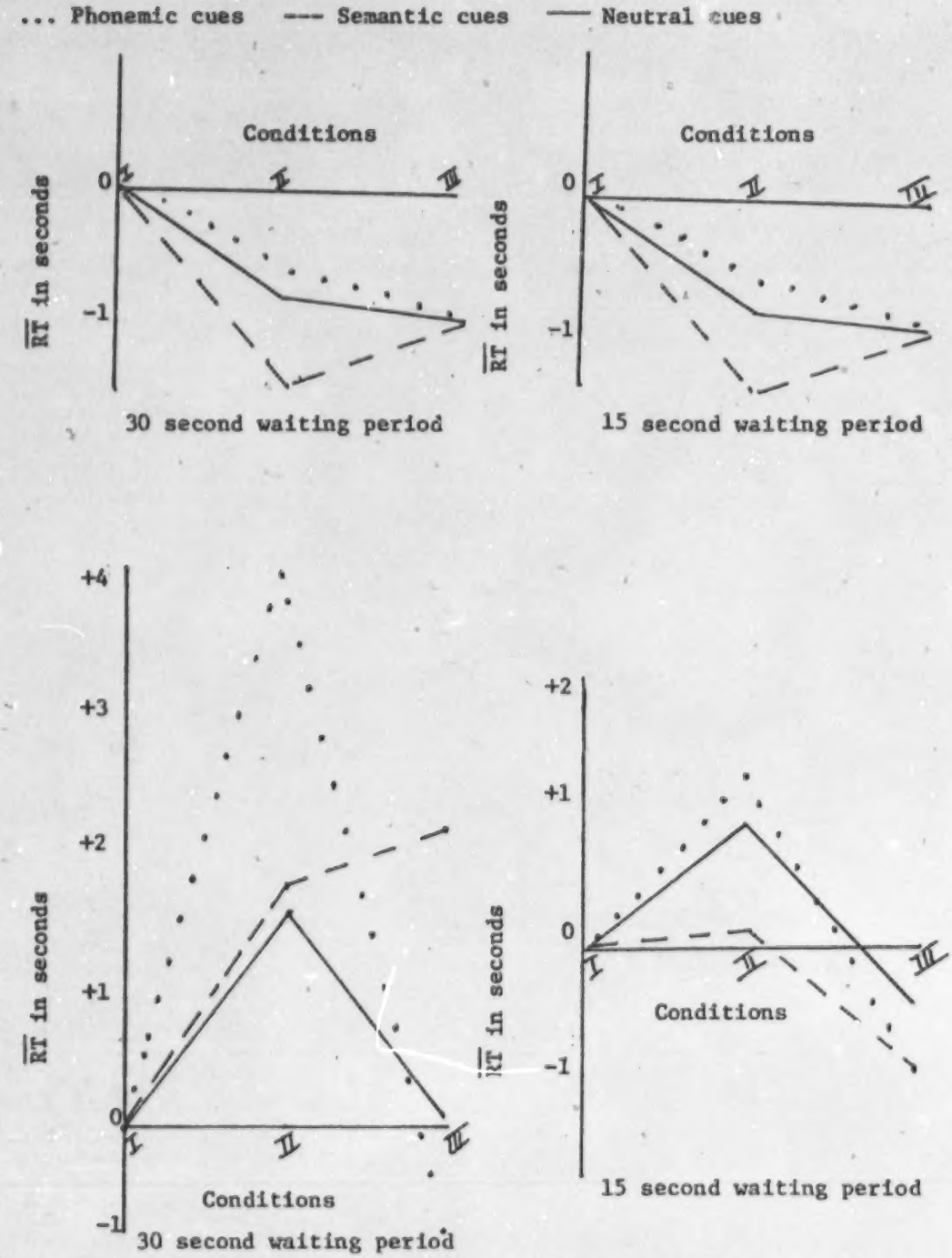


Figure 1: Comparison between two subjects' 15 and 30 second mean response time (RT) data. Subject 1 had identical graphs for both 30 second and 15 second RT data, while subject 3 had disparate graphs for 15 and 30 second RT data.

used in the present study was reliable only to ± .4 seconds, and the category of 1.0 to 1.9 seconds was the RT mode for each subject (Table IV), it is possible that a more reliable timing device would have altered the mean RT's slightly. That such a small alteration would be of clinical significance seems unlikely.

RESULTS AND DISCUSSION FOR INDIVIDUAL SUBJECTS

Organization and Display of Data

The data for each subject will be presented and discussed individually. It will be displayed in both tabular and graphical form. Table III (Chapter II, page 26) shows a nine cell matrix with the type of cue received by each subject for 20 out of 60 words presented in a given condition. The tables that follow will employ this format. Notice that the top set of 20 words in Table III received neutral cues in the first condition, semantic cues in the second condition, and neutral cues again in the third condition. The middle set of 20 words likewise received neutral cues in the first and third conditions; however, this set received phonemic cues in the second condition. The third set of words received neutral cues in all conditions to act as a baseline.

The tables for response accuracy presented for each subject contain in each cell the number of correct responses out of 20 possible correct responses.

The tables for response time for each subject contain the mean response time of the correct responses only; this means that the number of response times used to calculate the mean will vary cell by cell.

The response time (RT) and response accuracy (RA) graphs given for each subject do not represent the actual data presented in these tables. Instead, they represent difference scores: an increase or decrease from a starting point of zero in Condition I. An example of a response accuracy graph (Figure 2b) to illustrate difference scores comes from a hypothetical subject who scores 14 correct out of 20 words in Condition I (top left cell in Figure 2a). He then obtains a score of 16 under a semantic treatment in Condition II. This is a positive difference of two, and is represented on the graph by a positive rise of two units. The subject responds with 18 correct in Condition III, and the graph thus rises another two units. Note that for the second row of data, although the actual numbers are different, the graph (Figure 2c) displays an identical rise of two units in Condition II, and two units again for Condition III. Because decreases in correct responses for this subject occurred in Row 3 of Figure 2a, the graph (Figure 2d) shows an extension below the zero line in a negative slope.

The same type of graph will be used to display time latency data for each subject. A decrease in time will be shown by a line descending below the zero point on the graph in a negative slope. An increase in time would be shown by a positive slope.

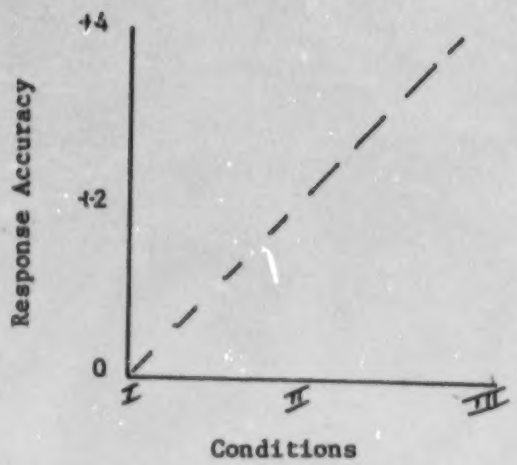
It might be noted here that more efficient communication would be indicated by a positive slope for response accuracy; i.e., more correct

2a.

Conditions

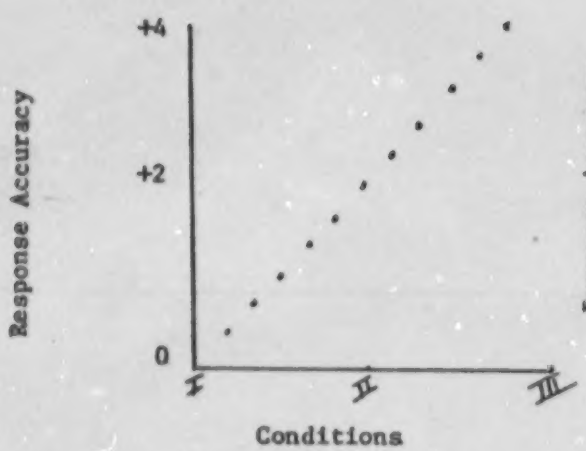
I	II	III
(N) 14	(S) 16	(N) 18
(N) 16	(P) 18	(N) 20
(N) 14	(N) 12	(N) 14

2b.



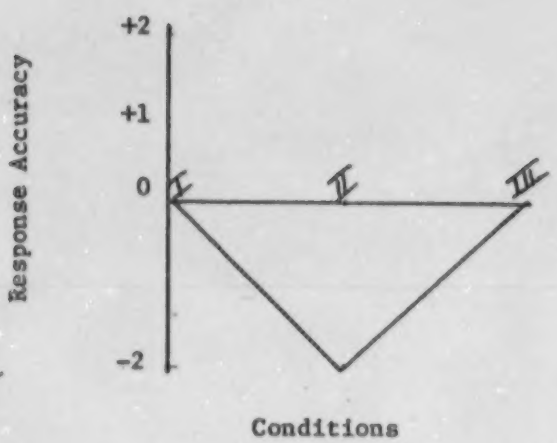
--- received semantic cue in Condition II

2c.



... received phonemic cue in Condition II

2d.



—— received neutral cue in Condition II

Figure 2: Obtaining difference scores from response accuracy (RA) data, out of 20 possible correct responses for a hypothetical subject across Condition I (neutral), Condition II (treatment) and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues.

responses, and a negative slope for response latency; i.e., responses occurring in a shorter amount of time (Figure 3).

Subject 1

S_1 was a 52 year old male who scored in the 80th percentile overall on the PICA (Appendix C). His data is represented in Figure 4. This subject's accuracy in Condition II increased one response with both netural and semantic cues. The phonemic cues did not change his accuracy. In Condition III, accuracy again improved by one response for the semantic cues, stayed the same for the neutral cues, and decreased with phonemic cues.

The mean time graph shows a decrease in mean time for all cue conditions, with a slightly greater decrease with semantic cues. In the third condition this decrease is maintained.

Semantic cues seemed to facilitate this subject's responses both in terms of increasing response accuracy (RA) and decreasing response time (RT). Phonemic cues did not alter his RA performance, but did decrease $\overline{RT}$. The baseline measure, as defined by administration of neutral cues, echoed this decrease in $\overline{RT}$. Therefore a practice effect may have been operating; the subject's responses may have been faster because of exposure to the same stimuli a second and third time. This same practice effect did not seem to affect RA, as the only increase in RA was for semantically cued words. If a practice effect had been operating for RA, accuracy on words administered with all three treatments might have been expected to improve.

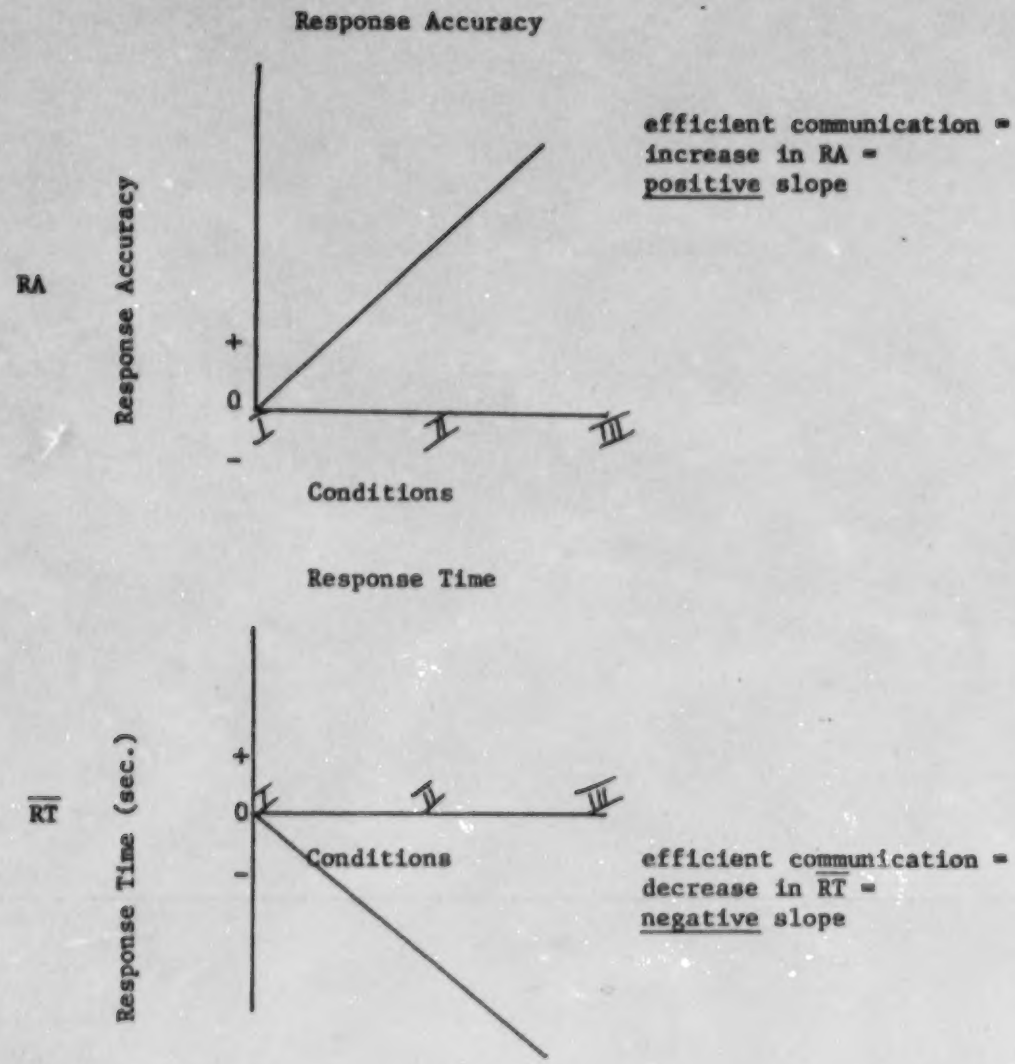


Figure 3: Prototypes of graphs indicating efficient communication for response accuracy (RA) and mean response time ($\overline{RT}$) data across three conditions.

RESPONSE ACCURACY

Conditions

I	II	III
(N) 16	(S) 17	(N) 18
(N) 18	(P) 18	(N) 17
(N) 16	(N) 17	(N) 17

MEAN RESPONSE TIMES

Conditions

I	II	III
(N) 2.9	(S) 1.5	(N) 1.9
(N) 3.3	(P) 2.8	(N) 2.5
(N) 2.7	(N) 2.0	(N) 1.9

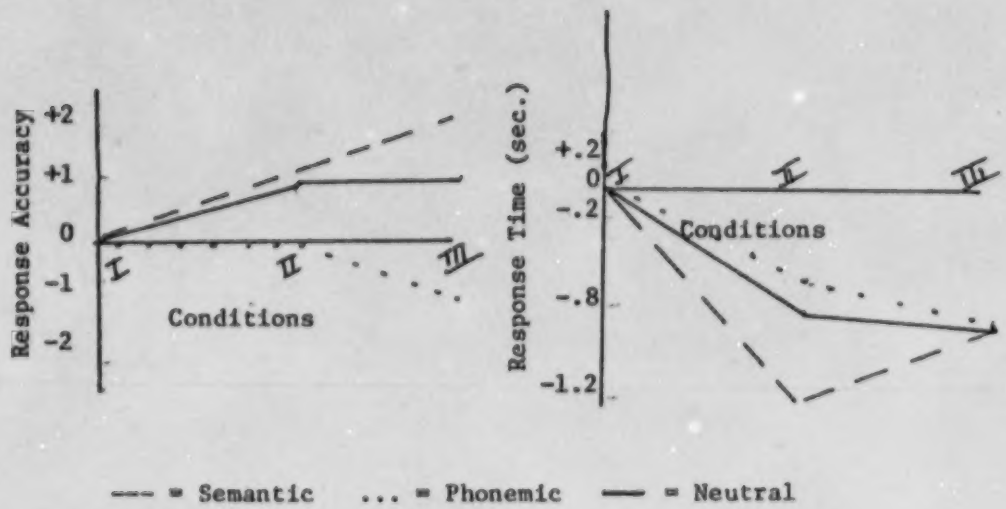


Figure 4: Data for subject 1: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (s), phonemic (p), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

Did any generalization occur for this subject? That is, did the effects of the cues carry over into the third, no treatment condition to continue to increase RA and decrease $\overline{RT}$? If this had been true, baseline would have remained stable from the second to the third condition while the treatment measurement would have changed. This happened with semantic cues in the third condition as their RA continued to rise, while baseline remained the same. However, it is difficult to draw a conclusion from a difference of only one response. For $\overline{RT}$, no generalization was noted. In summary, little or no generalization occurred with this subject.

The therapy of choice for this subject might include semantic cues. Although only a slight increase in response accuracy was noted, the observed decrease in response latency with these cues might lead to increased communicative efficiency.

Subject 2

S_2, a 65 year old male with a PICA overall percentile of 55 (Appendix C), showed different reactions to the cues than did S_1. His data is displayed in Figure 5.

S_2's response accuracy improved by two in Condition II with phonemic cues, decreased by two with neutral cues and decreased by three with semantic cues. In the third condition, phonemically and neutrally cued words returned to their original levels but semantically cued words stayed depressed.

For mean time scores, we notice that the semantic score actually increased a small amount while baseline decreased and the phonemic

RESPONSE ACCURACY

Conditions

I	II	III
(N) 15	(S) 12	(N) 12
(N) 16	(P) 18	(N) 17
(N) 17	(N) 15	(N) 17

MEAN RESPONSE TIMES

Conditions

I	II	III
(N) 1.5	(S) 2.0	(N) 1.5
(N) 1.5	(P) 1.5	(N) 1.1
(N) 2.2	(N) 1.6	(N) 1.4

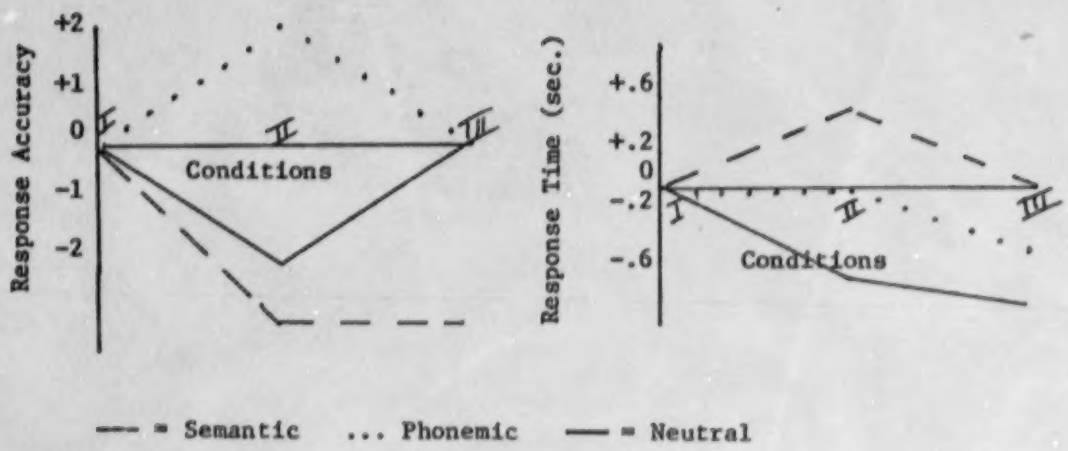


Figure 5: Data for subject 2: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

score remained stable. In the third condition, all mean time scores decreased slightly.

For this patient, it seems likely that the semantic cues inhibited his accurate and rapid naming of stimuli. Phonemic cues, on the other hand, improved accurate responding, although response time was not affected. Baseline, or neutral cues, decreased response accuracy.

Why would a cue that contained no information about a target decrease naming accuracy? It could be that in condition II, the patient expected information about the target, since he was getting semantic or phonemic cues on some of the words. When he did not receive it, it confused him. It also could be that confusion resulting from the semantic cues carried over to the words receiving neutral cues. This explanation makes an improvement in phonemic RA scores even more striking; the phonemic cue was useful enough to the patient so that he could overcome an interfering effect from seemingly misleading semantic or neutral cues.

No practice effect was seen in RA for this patient. A small effect was possibly demonstrated in the $\overline{RT}$ measurements; all these scores decreased slightly in Condition III. It may be recalled that S_1 showed the same effect.

This patient showed one possible instance of generalization of RA, unfortunately in the wrong direction! While phonemic and neutral cue scores returned to original level, the semantic score did not recover. It is possible that the effect of the seemingly confusing semantic cues in Condition II remained to interfere with accuracy in Condition III as well.

As phonemic cues increased accuracy for this patient, while the other cue types decreased it, therapy might include their use. However, this cueing technique might have limited value outside of therapy as no generalization was seen.

Subject 3

S_3, a 34 year old male with an overall PICA percentile of 67, was the only subject whose etiology was head trauma instead of left-sided cerebro-vascular accident. Figure 6 demonstrates his results.

It may be seen that in Condition II, the semantic RA score decreased sharply, the neutral RA score decreased a small amount, and the phonemic RA score increased somewhat.

In subjects S_1 and S_2, when RA increased, we saw a corresponding decrease in RT. Not so for S_3. While accuracy improved with phonemic cues in Condition II, response time worsened. And although response accuracy decreased greatly in Condition II, response time did not lengthen correspondingly. Response time did lengthen, however, with the neutral cues. The patient's patterns of responses explain this seemingly contradictory behavior in Condition II, however. This patient had a tendency to repeat the phonemic and neutral cues after the examiner. He rarely did this with the semantic cues. The more he failed to inhibit this imitative response, the more it concerned him, thus further delaying his final responses. He therefore gave relatively rapid inaccurate responses to semantic cues, and delayed, accurate responses to neutral and phonemic cues.

RESPONSE ACCURACY

Conditions

I	II	III
(N) 15	(S) 6	(N) 13
(N) 14	(P) 16	(N) 17
(N) 15	(N) 14	(N) 15

MEAN RESPONSE TIMES

Conditions

I	II	III
(N) 3.1	(S) 3.2	(N) 2.2
(N) 2.6	(P) 3.9	(N) 1.6
(N) 2.5	(N) 3.5	(N) 2.6

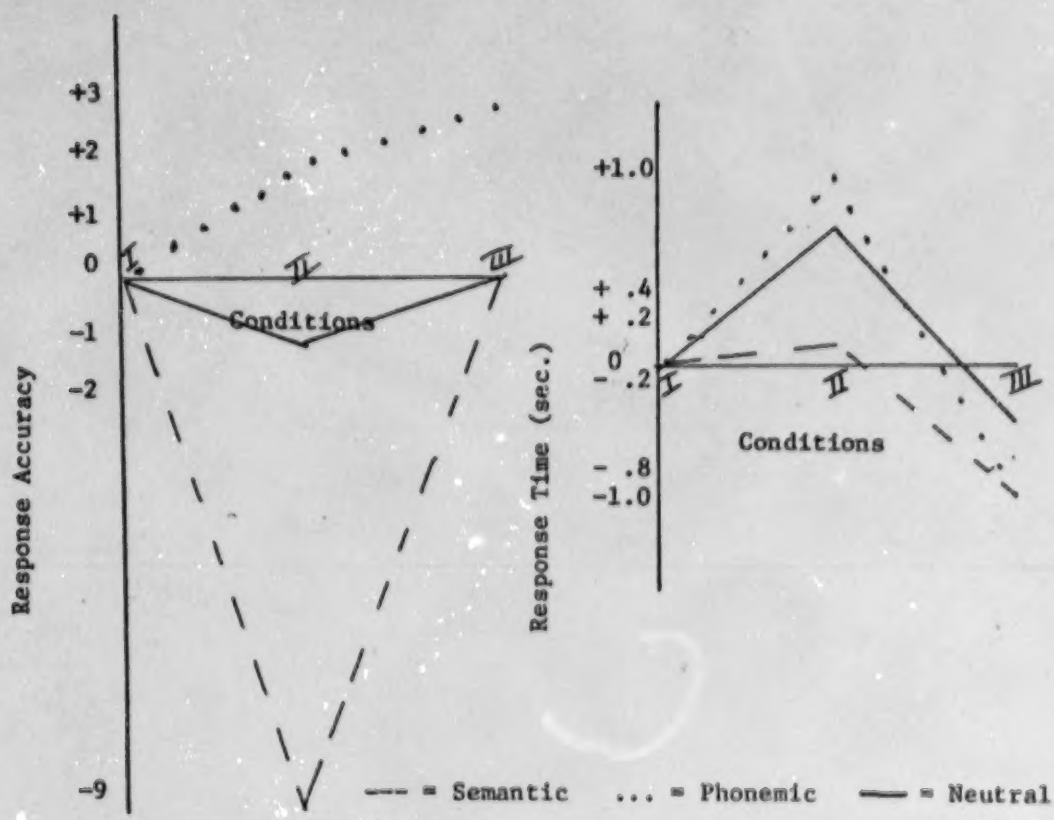


Figure 6: Data for subject 3: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

The effects of this imitative behavior on responses in Condition II are shown clearly by Condition III, when it no longer occurred. Response times decreased dramatically for all three cueing treatments. The semantic RA score recovered nicely, and the phonemic RA score continued its improvement.

A practice effect was again shown for RT in this subject, as all times decreased in Condition III. Generalization may have been shown for the phonemic score since RA continued to improve from Condition II to Condition III, while the neutral score showed a smaller amount of improvement.

No one type of cue was clearly better for this patient when both RA and $\overline{RT}$ are considered. Phonemic cues improved RA but worsened $\overline{RT}$ and semantic cues worsened RA while $\overline{RT}$ remained stable. However, if this patient were taught to inhibit his imitative responses to phonemic cues, his $\overline{RT}$ could improve. An improvement in $\overline{RT}$ coupled with the observed improvement in RA and the possible generalization he showed with phonemic cueing might make this method an appropriate one for use in therapy.

Subject 4

The data of S_4, a 55 year old male with a PICA overall percentile of 83 (Appendix C) demonstrated a decrease in RA for all three cue types (Figure 7). Phonemic and semantic scores decreased by one more response than the neutral score in Condition II, and then converged in Condition III.

RESPONSE ACCURACY

Conditions

I	II	III
(N) 15	(S) 13	(N) 14
(N) 14	(P) 12	(N) 13
(N) 15	(N) 14	(N) 14

MEAN RESPONSE TIMES

Conditions

I	II	III
(N) 3.2	(S) 2.4	(N) 2.2
(N) 3.9	(P) 2.3	(N) 3.6
(N) 2.2	(N) 3.3	(N) 2.4

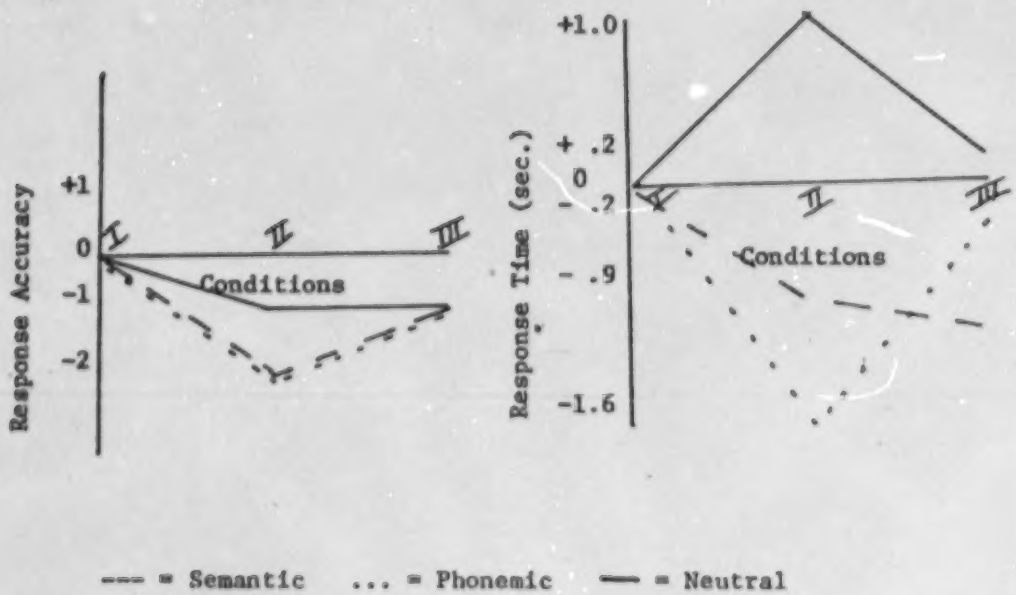


Figure 7: Data for subject 4: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

The $\overline{RT}$ data, however, showed widely disparate results. Phonemic cues decreased $\overline{RT}$ the largest amount but semantic $\overline{RT}$ was also reduced. Neutral cues actually increased $\overline{RT}$ in Condition II. As with S_2, S_4 may have expected information from the neutral cues that he wasn't getting, which confused him. This patient, in contrast to S_1, S_2 and S_3, showed no practice effect in Condition III. Generalization was also not observed. This is shown clearly by the $\overline{RT}$ of the phonemic score between Condition II and Condition III. While time decreased markedly in Condition II, the facilatory effect of the phonemic cues did not generalize to Condition III as $\overline{RT}$ increased back to its original level.

Because RA decreased with all three cue types, no one type obviously facilitated naming efficiency for this patient. The clinician's decision on which type of cue would be used in therapy, if any, would depend on whether the large decrease in response time was worth the small decrease in response accuracy.

Subject 5

S_5 was a 35 year old male with a PICA overall percentile of 81 (Appendix C). His performance is illustrated in Figure 8.

Phonemic cues increased S_5's RA markedly in Condition II while no change occurred with semantic cues. Neutral cues decreased accurate responses. Once again, similar to S_2 and S_4, perhaps the subject was confused by information he expected but did not receive in the neutral cues.

To accompany the increase in RA for phonemic cues, we find a large decrease in $\overline{RT}$ for these cues. $\overline{RT}$ increased slightly for semantic cues,

RESPONSE ACCURACY

Conditions

I	II	III
(N) 14	(S) 14	(N) 16
(N) 12	(P) 16	(N) 15
(N) 12	(N) 9	(N) 9

MEAN RESPONSE TIMES

Conditions

I	II	III
(N) 4.5	(S) 4.7	(N) 3.2
(N) 4.5	(P) 2.3	(N) 3.4
(N) 6.3	(N) 5.5	(N) 3.6

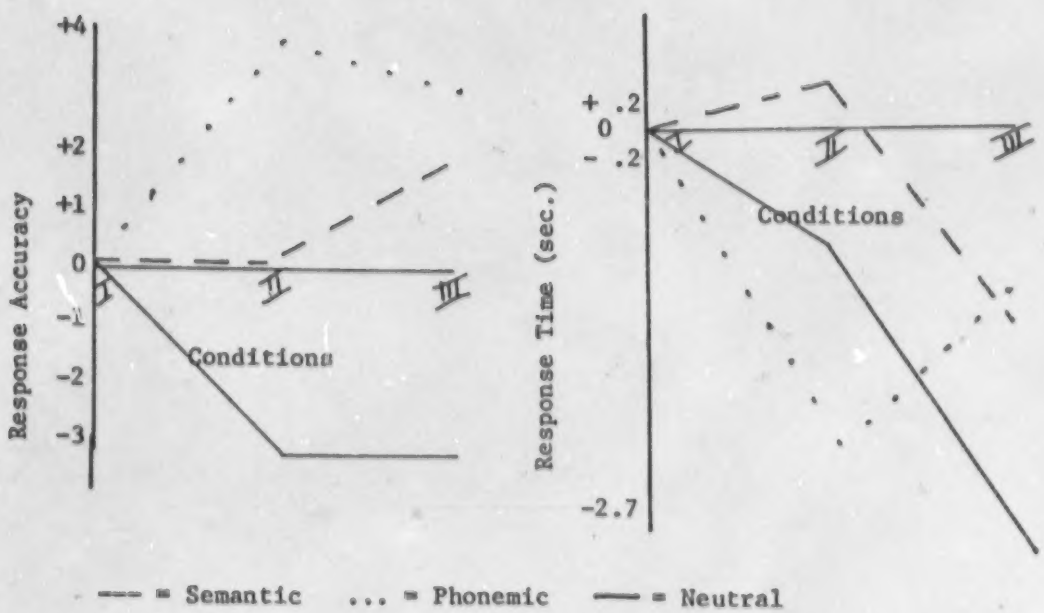


Figure 8: Data for subject 5: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

and decreased for neutral cues. The decrease in $\overline{RT}$ for neutral cues is surprising in view of the decrease in RA for these cues, and tends to contradict the hypothesis that the subject was confused by the lack of information contained in them. (This decrease probably indicates a practice effect.)

A practice effect is demonstrated in the drop of $\overline{RT}$'s for all cue types across the three conditions. Generalization is displayed in the RA of the phonemic cueing condition. Phonemic cueing improved accuracy in Condition II, and the effect of the improvement was still seen in Condition III although cues were no longer administered.

The therapy of choice for this patient would probably involve phonemic cues as they increased RA by four responses, decreased $\overline{RT}$ by 1.8 seconds, and some generalization of these effects was seen.

Subject 6

S_6 was a 59 year old male with a PICA overall percentile of 82 (Appendix C). Figure 9 displays his performance.

RA was affected favorably by both semantic and neutral cues, probably indicating some sort of practice effect and not a cueing effect. Phonemic cues did not affect RA.

$\overline{RT}$ decreased greatly for phonemic and neutral cues, but increased slightly with semantic cues. A practice effect was shown by a general decrease in $\overline{RT}$ across conditions; however, the decrease in $\overline{RT}$ for semantic cues in Condition III was extremely small and is negated by the four tenths second error margin.

RESPONSE ACCURACY

Conditions		
I	II	III
(N) 12	(S) 15	(N) 16
(N) 17	(P) 17	(N) 18
(N) 16	(N) 19	(N) 18

MEAN RESPONSE TIMES

Conditions		
I	II	III
(N) 3.4	(S) 3.9	(N) 3.2
(N) 4.3	(P) 2.5	(N) 2.3
(N) 4.2	(N) 2.6	(N) 3.0

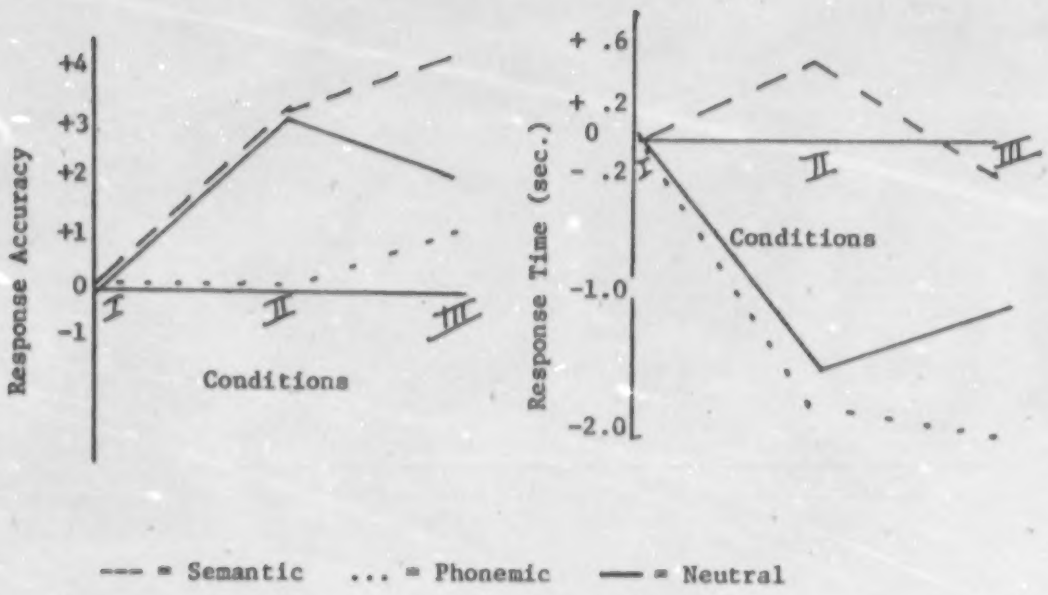


Figure 9: Data for subject 6: Response accuracy (RA) out of 20 possible correct and mean response times ($\overline{RT}$) in seconds across Condition I (neutral), Condition II (treatment), and Condition III (neutral) with use of semantic (S), phonemic (P), and neutral (N) verbal cues. The graphs illustrate changes in RA and $\overline{RT}$ across the three conditions.

A possible generalization effect is shown by RA with the semantic cues. While the rise in RA with semantic cues in Condition II is mirrored by a rise in RA using neutral cues, the RA continues to rise in Condition III with the semantic cues while it decreases for the neutral cues.

Because this patient's response accuracy and response latency seem to have been affected only by a practice effect, as shown by an increase in accuracy with neutral cues and a decrease in mean response time with neutral cues, use of either semantic or phonemic cues clinically would not seem appropriate.

COMPARISON OF PAIRS OF SUBJECTS

It may be recalled that the design of this study called for pairs of subjects to receive identical treatment. That is, both members of the pair received a given stimulus with the same cue. Because of the possibility of an interaction effect between the stimuli and cues, it was considered desirable to compare data between the pairs who were treated identically. For instance, perhaps the semantic cues for one set of 20 stimuli were better than the semantic cues for another set. In that case, the subject pair which was administered the optimum semantic cues would do better in the semantic cueing condition than another pair who received poorer semantic cues but optimal phonemic cues.

Subjects 1 and 4

For response accuracy, S_1 and S_4 had quite different results. S_4 had reduced accuracy with all cue types while S_1 had increased accuracy

with semantic and neutral cues and no change with phonemic cues. Mean time patterns are also dissimilar. S_1 had a decrease in mean time with all three cues. S_4, however, had a substantial increase in mean time with neutral cues. With phonemic cues his decrease was more than S_1's, and with semantic cues his decrease was less. As these two subjects exhibited quite different accuracy and latency response patterns, an interaction effect between cues and stimuli seems unlikely.

Subjects 2 and 5

Both these subjects reacted similarly to the phonemic cues; their accuracy increased. However, S_2's accuracy decreased with semantic cues while S_5's accuracy remained stable.

The mean time measurement for semantic cues was also similar; it increased for both subjects. Time measurements for phonemic cues were dissimilar.

It is possible that phonemic cues for these stimuli were especially effective in increasing accuracy because of the particular nature of those cues, but if this were true one would tend to expect similar patterns for response latency across the two subjects. Such similar patterns did not occur. The same argument holds true for the increase in mean time for semantic cues. If these semantic cues were particularly poor, one would expect a corresponding decrease in response latency which did not occur.

Because similar patterns did not appear across both measures of response efficiency, it is not likely that the observed similarities were due to interactions between cues and stimuli.

Subjects 3 and 6

S_3 and S_6 performed quite differently. Phonemic cues seemed to help S_3's accuracy, while semantic and neutral cues improved S_6's accuracy. Semantic cues severely decreased S_3's accuracy.

S_3 was the only subject who showed large increases in response time with both neutral and phonemic cues in Condition II. S_6, on the other hand, showed an increase in mean time with semantic cues.

Cue and stimulus interaction was not suspected with this pair of subjects because of the disparity between their results.

GROUP TRENDS

Consistency of Aphasics' Responses Across Time

As the data for the subjects is interpreted one aspect of the experimental design should be kept in mind. While the possibility of variation in the aphasics' performance in a single session was controlled for by a return to neutral cues in the third condition, possible consistency or variation of performance of the aphasic subjects in this study cannot be projected across time. Controversy exists on this topic in the literature, as previously discussed. Schuell et al. (1964) felt that aphasics showed consistency in their error patterns while the findings of Rochford and Williams (1963) contradicted this. The design of the present study did not allow for the determination of either consistency or variation in the aphasics' performance across time, as responses were studied in a single session only.

Response Accuracy and Latency

The stimuli employed in this study were words with a low frequency of occurrence in the English language. Low frequency words were selected to produce both inaccuracies and delays in the aphasics' responses, so that possible beneficial effects of cues could be studied. The results supported the effects of low frequency words cited in the majority of the literature (Long, 1976; Newcombe, Oldfield, and Wingfield, 1965; Oldfield and Wingfield, 1965; Rochford and Williams, 1963); subjects produced delayed responses to almost all stimuli as well as making many inaccurate responses. No subject produced more than 50 of 60 responses accurately in Condition I; the lowest score was 38 of 60 correct. Mean response time for each subject in each condition ranged from 1.1 to 6.3 seconds, with occasional responses taking much longer. Table IV illustrates the distribution of response times for each subject. These effects were found even though the uncertainty values of the stimuli were necessarily low, as the stimuli had to receive a consensus from normals before being employed in the study.

It is possible that the delays would have appeared in the aphasic subjects regardless of whether high or low frequency stimuli were used, as Long (1976) found an insignificant difference in time required to name high and low frequency stimuli. Delays were found by some investigators to be inherent in the performance of aphasics when compared to normals (Arrigoni and DeRenzi, 1964; Benson and Barton, 1970; and Mills, 1975).

This study demonstrated the value of measuring response latency as well as response accuracy in a naming study. While some subjects' response accuracy remained stable with a certain cue type, their response latency decreased markedly. The decrease in response latency was seen as an increase in communicative efficiency, when response accuracy was already present.

Investigation of Routinely Used Therapy Techniques

As previously discussed, several researchers (Helmick and Wipplinger, 1975; Brookshire, 1975) found that the use of some therapy techniques commonly used in aphasia therapy was not justified after their effects had been studied in a controlled manner.

The results of this study tend to support the above observation. The aphasic subjects used in this study varied widely in their response to the types of cues used. The same cue type that hindered some subjects helped others. These results reinforce the notion that additional therapy methods, currently presumed effective, should be studied experimentally.

Cueing

Few group trends were seen in response to any one cue type. In general, however, more subjects (five of the six) were helped by phonemic cues than by the other two types, as measured by response latency, response accuracy, or both. The converse was true for semantic cues; five of six subjects were hindered by these cues. It must be noted that individual subjects contradicted both of these trends.

Marshall (1976) found that self-generated semantic and phonemic cues were equally effective in helping aphasics name a target word. Perhaps, then, the fact that the semantic cues used in this study were not self-generated limited their effectiveness. Several subjects appeared quite puzzled by the semantic cues as they were administered.

The type of semantic cue used in this study was a one-word association. This is not the same type of semantic cue as that used in Barton, Maruszewski, and Urrea (1969) or Rochford and Williams (1962). While these studies found semantic cues to be most helpful, they used open-ended sentences or contextual cues as their semantic cue type. Since normal subjects in the present study selected the one-word semantic cues, there was no way to control for the amount of information they contained. Wiig and Globus (1971) found high association clue words increased response accuracy in normals and aphasics more than low association words. Perhaps the semantic cues supplied by the normals had low association strengths with the targets. This aspect of the semantic cues was not controlled for in this study.

Practice Effect and Generalization

As the previous literature review suggested, controversy surrounds the question of practice effect (Rochford and Williams, 1963; Oldfield and Wingfield, 1965; Schuell et al., 1964). These investigators used response accuracy as their dependent variable in an attempt to discover a practice effect.

In the present study, both response accuracy and response latency data were examined for a practice effect; i.e., improvement of perfor-

mance after repeated exposure to the same stimuli. It was hypothesized that to show a practice effect, all three cue types must have resulted in an increase in response accuracy or a decrease in response latency or both across Conditions II and III. If no such effects were shown on the neutrally cued responses, effects on the other two groups of words must be assumed to be due to learning. Four of the six subjects showed a decrease in mean time for neutral cues from Condition I to Condition III, and five of the six subjects showed a similar decrease from Condition II to III. These results presumably indicate the occurrence of a practice effect. No such effect was noted when the response accuracy data was reviewed. This finding again illustrates the value of measuring response latency as well as response accuracy.

Generalization, a continued increase in learning after cues were removed, was seen as a possiblity in the response accuracy data of only three subjects, already described. No conclusions can be drawn in this area as the possible effects were so small. Generalization was not noted at all in response latency data. The definition of generalization used in this study was a limited one and does not apply to unfamiliar sets of stimuli; that is, the effect was studied in stimuli that had been previously named by the subject.

Theory of Word Retrieval

Results of this study seem to support the theory that aphasia causes difficulty in retrieval of a lexical item rather than actual reduction of the lexicon. Condition I, administered without cues, might be viewed as an assessment of lexical size for the stimulus items

used in the study. Then if the cues administered in Condition II neither increased nor decreased accuracy of response, this might support the idea of lexicon reduction in aphasia. However, these aphasic subjects showed both increases and decreases with various cue types in Condition II. Specifically, semantic cues inhibited retrieval in the majority of subjects while phonemic cues facilitated retrieval of the stimuli.

Implications for Treatment

Data obtained from this study indicate the individual nature of the aphasic subjects' responses to the cues in this study. Directions for therapy were suggested after a discussion of each subjects' data. However, some general ideas can be stated.

It must not be assumed that cues in general will facilitate word retrieval in any given subject. Each type of cue was found to hinder responses in at least one subject.

It also must be kept in mind that the aphasics in this investigation were relatively high level, with PICA overall percentiles ranging from 55 to 83. The effects of those cue types which seemed to facilitate retrieval in some subjects cannot be generalized to lower level aphasics. Marshall (1976) found that lower level aphasics were much less successful in utilizing self-generated cues than higher level aphasics.

When using cues with aphasics, the two variables that defined communication efficiency in this study must be remembered. A cue type that increases a subject's response accuracy may be simultaneously

increasing his response latency. The clinician must decide whether this trade-off is worth the results.

Apraxic patients were specifically excluded from this study. It cannot be inferred from these results that cues which reduced response latency in aphasics would have the same effect on apraxics or aphasics with an apraxic component.

This study points out that the therapy needs of the individual aphasic subjects were quite different. The efficiency of cues must be individually determined for optimal results from therapy.

Directions for Future Research

The value of using response latency as a measure of communication efficiency, in addition to response accuracy, has been amply demonstrated. Cue types which did not increase response accuracy in some subjects did improve their responses by decreasing response latency. If response latency had not been included as a variable in this study, the observed practice effect would have been overlooked. It is suggested that future inclusion of the variable of response latency in naming studies would yield valuable information.

Different aspects of the cues used in this study could be included in future studies. Because contextual semantic cues were found successful in improving response accuracy in previous studies (Rochford and Williams, 1962; Barton, Maruszewski and Urrea, 1969), perhaps response latency could be studied in conjunction with this type of cue. The association strengths of the semantic cues with their targets was not controlled for in the present research; high association strength

semantic cues could be compared with phonemic cues to test their relative effectiveness in increasing response accuracy and decreasing response latency.

The phonemic cues in this study contained varying amounts of information because their length was determined by the varying lengths of the target words. One way to control for this would be to use target words of more comparable lengths, and thus have all phonemic cues a uniform syllable in length. It is still difficult to determine, however, the relative amounts of retrieval information contained in a phonemic versus a semantic cue for a given target word.

The word "ready" was presumed to be a neutral one in this study. Future investigators should take into account this debatable assumption. Perhaps the effects of various words containing no information about a target could be compared as to their effects on response accuracy and response latency. The possibility of using no cue should also be considered. Using the word "ready" may have interfered with the aphasics' processing in some way. In therapy, of course, no neutral cue is used, so comparing semantic and phonemic cues with a no-cue condition would approximate the therapy situation more closely.

Apraxic patients were not studied in this investigation. It might be interesting to use a naming task including various cue types with this population and compare results with those found for an aphasic population.

Future investigators might keep in mind the marked individual differences observed in the aphasic subjects used in this study. Grouping these subjects' data might have obscured the individual effects of the

cues, as individual subjects' data sometimes ran counter to the group trends. Thus, using an individual subject design might be valuable for some research with aphasics.

Fertile ground for future research is the experimental investigation of therapy techniques which are currently assumed to be beneficial to aphasic patients. For instance, how do reading or writing therapy tasks affect communicative efficiency? This study showed that cueing, often used in aphasia therapy, was not universally effective with six aphasic subjects.

CHAPTER IV

SUMMARY

The purpose of the present investigation was to answer the following questions:

1. What effect do semantic, phonemic, and neutral verbal cues have on the accuracy of aphasic subjects' naming responses?
2. What effect do semantic, phonemic, and neutral verbal cues have on the latency of aphasic subjects' naming responses?

One hundred low frequency stimulus pictures were shown to ten normal subjects. Sixty pictures were selected from these 100 stimuli based on the consensus of the normal subjects on labels for the pictures. The normal subjects also chose semantic cues for the stimulus items by picking a "next best" word for each item. Six aphasic subjects then viewed the 60 items under three conditions. In the first condition, presentation of all items was accompanied by the neutral verbal cue "ready." In the second condition, a neutral cue accompanied 20 of the stimuli, a phonemic cue accompanied 20 additional stimuli, and a semantic cue accompanied the remaining 20 stimuli. In the third condition all 60 stimuli were again administered with the neutral cue "ready."

The results demonstrated clear individual differences in the way that the aphasics responded to the various types of cues. In general, however, phonemic cues proved to be the most effective in increasing response accuracy and decreasing response latency for these patients. Semantic cues, on the other hand, appeared to hinder communicative

effectiveness as they decreased response accuracy and increased response latency when compared to neutral or phonemic cues.

A possible practice effect, improvement of performance after repeated exposure to the same stimuli, was seen in the response latency data of the majority of the aphasic subjects. This effect was not observed in the response accuracy data. Generalization, or an increase in learning after removal of treatment, was not found.

The value of studying response time as well as response accuracy was shown, as several effects from the cueing appeared only in the response time data. Communicative effectiveness is not present unless responses are both prompt and accurate.

Because the aphasics in this study were able to retrieve more words when various cues were used, the idea that aphasia is a retrieval problem rather than an absolute reduction in lexicon is supported. If the lexical items had been lost from the memory, the cues would not have facilitated their recall.

This study supported the notion that more techniques often used in aphasia therapy should be studied experimentally. Phonemic and semantic cues, commonly used with aphasic patients, do not universally enhance communicative efficiency as measured by both response accuracy and response latency.

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APPENDIX A

SUMMARY OF TEST ITEMS

Target Word	Frequency per 100,000	Phonemic Cue	Semantic Cue	Consensus on S* Cue by Ten Judges	Cue Conditions Subjects nos. 1&4 S*	2&5 P*	3&6 N*
helicopter	2	/hɛl/	whirlybird	4	P	N	S
helmet	2	/hɛl/	headgear	5	N	S	P
iron	2	/aIɚ/	presser	6	S	P	N
jello	2	/dʒɛl/	dessert	5	P	N	S
judge	2	/dʒʌ/	court	5	N	S	P
ladder	2	/læd/	step	5	S	P	N
letters	2	/lɛt/	mail	4	P	N	S
lumber	2	/lʌm/	wood	3	N	S	P
plumber	2	/plʌ/	pipefitter	3	S	P	N
rainbow	2	/reIn/	pot o' gold	4	P	N	S
reindeer	2	/reIn/	santa	3	N	S	P
screws	2	/skr/	bolts	3	S	P	N
lid	2	/lI/	cover	6	P	N	S
snake	2	/sneI/	reptile	5	N	S	P
star	2	/sta/	sky	3	S	P	N
swing	2	/swI/	plaything	2	P	N	S

Target Word	Frequency per 100,000	Phonemic Cue	Semantic Cue	Consensus on S* Cue by Ten Judges	Cue Conditions Subjects nos. 1&4 S*	2&5 P*	3&6 N*
ambulance	3	/æmb/	emergency	3	S	P	N
stool	3	/stu/	sit	4	P	N	S
tennis	3	/tɛn/	court	3	N	S	P
angel	3	/eIndʒ/	heaven	6	S	P	N
bathroom	2	/bæɹ/	restroom	3	P	N	S
bear	2	/bɛ/	animal	6	N	S	P
blocks	2	/bla/	building	3	S	P	N
camera	2	/Kæm/	picture	6	P	N	S
crutches	2	/Krʌ/	support	4	N	S	P
dentist	2	/dɛn/	teeth	5	S	P	N
doll	2	/dɔ/	toy	5	P	N	S
eggs	2	/ɛ/	breakfast	5	N	S	P
electrician	2	/ilɛ/	wiring	4	S	P	N
finger	2	/fIŋ/	nail	4	P	N	S
globe	2	/glo/	world	5	N	S	P
glove	2	/glʌ/	mitten	4	S	P	N

Target Word	Frequency per 100,000	Phonemic Cue	Semantic Cue	Consensus on S* Cue by Ten Judges	Cue Conditions Subjects nos. 1&4 S*	2&5 P*	3&6 N*
typewriter	2	/taIp/	machine	2	N	S	P
wagon	2	/wæg/	toy	4	S	P	N
waiter	2	/weIt/	server	6	P	N	S
wheelchair	2	/hwil/	crippled	3	N	S	P
arrow	1	/ɛr/	bow	6	S	P	N
basket	1	/bæs/	container	6	P	N	S
blanket	1	/blæ/	cover	6	N	S	P
flag	1	/flæ/	banner	4	S	P	N
moon	1	/mu/	quarter	3	P	N	S
pie	1	/p/	apple	6	N	S	P
pipe	1	/paI/	smoke	7	S	P	N
refrigerator	1	/rɛf/	icebox	8	P	N	S
saddle	1	/sæd/	horse	7	N	S	P
salads	1	/sæl/	vegetables	4	S	P	N
shelf	1	/ʃɛl/	ledge	2	P	N	S
ski	1	/sK/	snow	6	N	S	P

Target Word	Frequency per 100,000	Phonemic Cue	Semantic Cue	Consensus on S* Cue by Ten Judges	Cue Conditions Subjects nos. 1&4 S*	2&5 P*	3&6 N*
toys	1	/t/	playthings	6	S	P	N
vegetables	1	/vɛdʒ/	garden	5	P	N	S
window	1	/wIn/	pane	4	N	S	P
aquarium	0 (2)	/ʌKw/	tank	3	S	P	N
barber	0 (6)	/bar/	haircut	5	P	N	S
bench	0 (3)	/bɛn/	seat	4	N	S	P
coal	0 (2)	/Ko/	mine	6	S	P	N
crackers	0 (2)	/Krɛ/	saltine	6	P	N	S
diaper	0 (2)	/daIp/	baby	5	N	S	P
safe	0 (3)	/seI/	vault	5	S	P	N
shell	0 (4)	/ʃɛ/	clam	3	P	N	S
shepherd	0 (2)	/ʃɛp/	sheep	4	N	S	P

S* = semantic P* = phonemic N* = neutral

SUMMARY OF PRACTICE ITEMS

Target Word	Frequency per 100,000	Phonemic Cue	Semantic Cue	Consensus on S* Cue by Ten Judges	Cue Conditions Subjects nos. 1&4 S*	2&5 P*	3&6 N*
drill	2				N	N	N
maid	2				N	N	N
sky	2		clouds	5	S	S	S
ash	2		cigarette	6	S	S	S
stairs	2				N	N	N
desserts	1	/dɛz/			P	P	P
address	2				N	N	N
shovel	2		spade	4	S	S	S
sailboat	2	/seIl/			P	P	P
policeman	1	/pol/			P	P	P

S* = semantic P* = phonemic N* = neutral

APPENDIX B

NORMAL SUBJECTS CHARACTERISTICS

Subject	Age	Education
S_1	27	High School
S_2	69	Eighth Grade
S_3	64	Seventh Grade
S_4	33	College
S_5	34	High School
S_6	75	Tenth Grade
S_7	50	High School + 2 years technical
S_8	49	Tenth Grade
S_9	65	High School
S_{10}	78	College
Mean	54.4	mean 11.5 years

APPENDIX C

APHASIC SUBJECTS CHARACTERISTICS

	CHARACTERISTICS			PICA					
Subject	Age	Education	Etiology	Months post Onset	Overall %ile	Subtests IV	X	XI	dyspraxia/ dysarthria median
S_1	52	High School	Left CVA	12	80%	12.7	15.0	15.0	
S_2	65	9th Grade	Left CVA	6	55%	8.8	15.0	15.0	0
S_3	34	10th Grade	Head Trauma	109	67%	11.2	15.0	15.0	2
S_4	55	High School	Left CVA	13	83%	12.6	15.0	15.0	0
S_5	35	High School	Left CVA	109	81%	10.3	15.0	15.0	0
S_6	59	College	Left CVA	13	82%	11.0	15.0	15.0	1
mean	50	mean 11.8 years							

APPENDIX D

DYSPRAXIA/DYSARTHRIA SCREENING

Dyspraxia/Dysarthria Screening

"Now I want you to say some sounds. Say them as fast and as long as you can."

(Present each task twice. Score the second trial.)

	RATING	
	Apraxia	Dysarthria
a) "Say puh-puh-puh-puh-puh."	_____	_____
b) "Say tuh-tuh-tuh-tuh-tuh."	_____	_____
c) "Say kuh-kuh-kuh-kuh-kuh."	_____	_____
"Now, take the three sounds - puh, tuh, and kuh - and put them together."		
d) "Like this, puh-tuh-kuh-puh-tuh-kuh-puh-tuh-kuh."	_____	_____

"Now I want you to say some words after I say them."

(Present each word once. If patient requests a repetition, give it but score first response.)

	RATING	
	Apraxia	Dysarthria
a) "Say gingerbread."	_____	_____
b) "Say artillery."	_____	_____
c) "Say snowman."	_____	_____
d) "Say impossibility."	_____	_____
e) "Say catastrophe."	_____	_____
f) "Say television."	_____	_____

"Say these words after I say them." (Present each word once, and let the patient respond before going on to the next word. Repeat if requested but score first response.)

	RATING	
	Apraxia	Dysarthria
a) "Say thick."	_____	_____
"Say thicker."	_____	_____
"Say thickening."	_____	_____
b) "Say jab."	_____	_____
"Say jabber."	_____	_____
"Say jabbering."	_____	_____

	RATING	
	Apraxia	Dysarthria
c) "Say zip."	_____	_____
"Say zipper."	_____	_____
"Say zippering."	_____	_____
d) "Say please."	_____	_____
"Say pleasing."	_____	_____
"Say pleasingly."	_____	_____

"Repeat these sentences after me." (Present each sentence once. Repeat if requested but score first response.)	RATING Apraxia	Dysarthria
a) "Please put the groceries in the refrigerator."	_____	_____
b) "Arthur was an oozy, oily sneak."	_____	_____
c) "In the summer they sell vegetables."	_____	_____
d) "The valuable watch was missing."	_____	_____
e) "The shipwreck washed up on the shore."	_____	_____

OVERALL RATING

Apraxia of Speech (Check One)

_____(1) Yes
_____(2) No
_____(9) Undetermined

Severity_____(1-7, 1 = mild)

Reason (specify) _____
_____

Dysarthria (Check One)

_____(1) Yes
_____(2) No
_____(9) Undetermined
Reason (specify)_____
_____
_____

Severity_____(1-7, 1 = mild)

Type (Check One)_____(1) Spastic
_____(2) Flaccid
_____(3) Spastic/ Flaccid
_____(4) Ataxic
_____(5) Hypokinetic
_____(6) Hyperkinetic
_____(7) Other (specify)

APPENDIX E

CONSENT FORM

CONSENT FORM

1. I understand that I am to be a subject in a research study which will investigate how normal subjects and traumatized patients name pictures.

2. It has been explained to me that I will be shown a group of pictures and will be asked to write or name each one as accurately as possible with the best word that I can recall.

3. My participation in the study is voluntary; I understand that I may withdraw from participation at any time without question or penalty.

4. It has been explained to me that there is little liklihood my performance as a subject will have any direct therapeutic benefit to me, but that the data obtained from me may be of value to other patients in the future.

5. I understand that there are no known foreseeable risks, no pain, and no discomfort involved with my participation.

6. I have been assured that any data obtained from me will be treated in an entirely confidential manner and that my anonymity will be preserved in the event the data are published.

7. Any and all questions which I have raised about the six statements above have been answered to my satisfaction.

8. I hereby volunteer and consent to participate in this research study.

_____ _____

Signature of Co-Investigator Signature of Participant

_____ _____

Name of Co-Investigator Name of Participant

I, the undersigned, was present during the discussion of the above information for the study of labeling behavior. I believe that the volunteer named above understood its context.

_____

Signature of Witness

_____ _____

Name of Witness Date